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MARGINAL TAX RATES, SOCIAL SECURITY WEALTH, AND PERSONAL SAVING: SOME TIME SERIES EVIDENCE

A STUDY

PREPARED FOR THE USE OF THE

SUBCOMMITTEE ON MONETARY AND FISCAL POLICY

OF THE

JOINT ECONOMIC COMMITTEE

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LETTER OF TRANSMITTAL

June 23, 1982

Hon. Henry S. Reuss
Chairman, Joint Economic Committee
Congress of the United States
Washington, D.C.

Dear Mr. Chairman: I transmit herewith a study entitled, "Marginal Tax Rates, Social Security Wealth and Personal Saving: Some Time Series Evidence." The study was prepared by Dr. Timothy P. Roth of the Department of Economics and Finance at the University of Texas at El Paso. The author wishes to thank Mark R. Policinski of the Joint Economic Committee staff for his assistance, though the author assumes full responsibility for any errors that may appear in the manuscript.

Sincerely,

Roger W. Jepsen
Chairman, Subcommittee on Monetary and Fiscal Policy

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MARGINAL TAX RATES, SOCIAL SECURITY WEALTH, AND PERSONAL SAVING: SOME TIME SERIES EVIDENCE

by

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(1)

I. INTRODUCTION

Since the appearance of Martin Feldstein's (1974) study suggesting that each dollar of gross social security wealth reduces saving by over two cents, much attention has centered upon the potential role of social security in depressing private saving. Numerous time series studies have appeared, as have a number of micro-data cross-section analyses. Because the results of these efforts have recently been surveyed (Danziger, Haveman and Plotnick, 1981), no purpose would be served in replicating them here. Suffice it to say that a balanced assessment of both the time series and the micro-data based studies suggests that:

> There is little robust time-series evidence of a significant negative relationship between Social Security and private savings.

Moreover,

> The cross-section results...yield much the same mixed picture as the time series results. (Danziger, Haveman and Plotnick, 1981, pp. 1003 and 1005)

In the case of the time series models, the problem is traced to the fact that "Numerous factors that might be expected to influence savings... are not included in the regressions" (Danziger, Haveman and Plotnick, p. 1003). The assessment of the various cross-section studies is roughly the same "...factors affecting savings for non-life-cycle reasons are often not measured" (Danziger, Haveman and Plotnick, p. 1005). The recurring theme is that a better understanding of the relationship between social security wealth and private savings must be pre-

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dicated upon the explicit introduction of, inter alia, the relative prices of consumption and saving.

There is, of course, ample reason to be concerned about the potentially negative effect of social security wealth accumulation upon private saving. There is evidence to suggest, for example, that the U.S. economy has for some time been subject to a shortfall of saving relative to its optimal level.[1/] Granting this, the corollary is that investment is below its optimal level.

Whatever else is said about it, this much is clear: At the same time that employment growth was accelerating, the growth rate of net nonresidential private domestic investment declined.[2/] This is important because of the role played by capital accumulation in the economic growth process.

Jorgenson (1980) has argued, for example, that the 3.5 percent secular growth rate of real G.N.P. can be decomposed. In his view, "For the postwar period as a whole, the contribution of capital input of 1.6 percent is the most important source of output growth. Productivity growth is next most important at 1.4 percent, while the contribution of labor input is the third most important at 0.75 percent" (Jorgenson, 1980, p.8).

Given that saving is a sine qua non for investment, and given the central role of capital accumulation in economic growth, a shortfall in saving is a matter of considerable concern.

But the role of saving extends beyond the matter of real G.N.P. growth rates. Most empirical studies suggest that the elasticity of substitution of capital for labor in the U.S. economy is less

than one. Granting this, increases (decreases) in the aggregate capital-labor ratio increase (decrease) labor's gross share of national income.

Indeed, increases in the capital-labor ratio will increase the wage-rental ratio irrespective of the elasticity of substitution (Boskin, 1978, p. S19). Insofar as saving falls below its optimal level, labor's share of national income will therefore be lower than would otherwise be the case.

It is against this background that the relationships among personal saving and its determinants must be assessed. The purpose of this paper is to secure empirical estimates of the relevant elasticity coefficients, but to do so in the context of a model which includes among the determinants of personal saving, marginal and average tax rates, interest rates and wealth, where the latter subsumes both non-social security and social security wealth. The model is designed, in other words, to come to grips with the objections cited above; namely, the failure systematically to allow for changes in the relative prices of consumption and saving.

II. THE MODEL

In the orthodox formulation, saving is a function of disposable income and "the" interest rate. The logic here is straightforward: Saving is presumed to be a function, not only of current income, but of changes in the relative prices of consumption and saving.

The problem has been that too little attention has centered on other determinants of saving. In particular, while much attention has centered on the relationship between wealth and personal saving, little empirical work has been done on the relationship between changes in tax rates and personal saving.

The point of departure here is that a fuller understanding of the relationships among personal saving and its various determinants can be secured by focusing on a more explicit characterization of the individual saver's decision environment.

It is useful to think of the saver's decision process as involving two stages. At stage one, he decides, given his preference structure, the wage rate, prevailing tax rates and his wealth position, how much labor he is willing to supply. In effect, he solves a constrained maximization problem where his objective is the maximization of utility subject to a constraint defined by the wage rate and the prevailing tax code. The result of this constrained maximization process is the emergence, inter alia, of the taxpayer's current income level. Then, at stage two, the desired level of saving is determined given the income level determined at stage one, and given the level of interest rates.

On this logic, assume that the individual taxpayer seeks to maximize

(1) $$U = f(y_d, L),$$

where U is the utility derived per unit time given disposable income (y_d) and the amount of leisure taken (L). Equation (1) is not maximized in vacuuo, however. The relevant constraint is given by

(2) $$g(\bar{w}, t_1, y_T^1) + h(\bar{w}, t_2, y_T^2) + k(\bar{w}, t_3, y_T > y_T^2) = y_d$$

where $\bar{w}$ is the market determined wage rate and where t_1, t_2, and t_3 denote the marginal tax rates such that $t_1 < t_2 < t_3$.[3] In the situation envisioned, t_1 obtains for taxable income levels up to and including y_T^1; t_2 obtains for taxable incomes greater than y_T^1 but not in excess of y_T^2, and t_3 obtains for taxable incomes in excess of y_T^2.

The solution to the constrained maximization problem defined by equations (1) and (2) is shown in Figure 1:

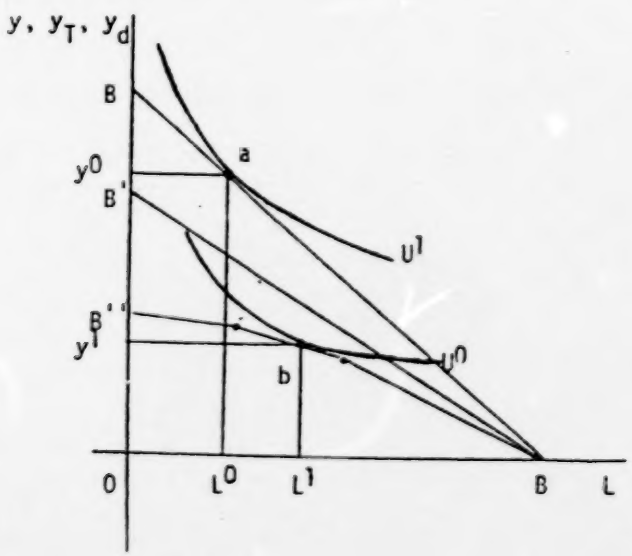

Figure 1

Constraints BB, BB', and BB'' are defined for the same nominal wage, but BB' and BB'' embody the essential features of the progressive income tax structure. BB' yields, for any level of nominal income the associated level of taxable income.[4/] BB'' shows, for a given level of taxable income, the associated disposable income.

In the absence of taxes, point "a" yields the optimal income-leisure solution (y^0, L^0). Point "b" yields the optimal solution (y_d^1, L^1), given the progressive income tax structure. While this is not a necessary result, the shift from constraint BB to BB'' results in an increase in leisure ($L^1 > L^0$), and a reduction in disposable income ($y_d^1 < y^0$).

Granting the logic of equations (1) and (2), it follows that

$$(3) \qquad NDINC_t = f(MTR_t, ATR_t, w_t),$$

where $NDINC_t$ is aggregate nominal disposable income, MTR_t and ATR_t are the marginal and average tax rates confronting taxpayers, w_t is the wage rate, and t denotes the current time period.[5/]

Equation (3) is, however, incomplete. It is recognized that taxpayers' wealth positions affect the income-leisure choice.[6/] The presumption is that, ceteris paribus, increases in wealth reduce the quantity of labor willingly supplied at any wage. On this logic, equation (3) may be rewritten as

$$(4) \qquad NDINC = g(MTR_t, ATR_t, w_t, W_t)$$

where W_t is the taxpayer's wealth position at period t.

Equation (4) can be simplified. As it happens, the correlation coefficient linking w_t and W_t is 0.934. This suggests that the employment of both the wage rate and taxpayer wealth as "independent" regressors in the income function (and, pari passu,

in the saving function) would jeopardize the integrity of the individual regression coefficients. Therefore, we must simplify the equation by deleting the wage rate from equation (4) yielding:

(4') $\quad NDINC_t = h(MTR_t, ATR_t, W_t)$

as the equation for nominal disposable income.

When equation (4') was subjected to empirical test, the following results emerged: With an R^2 of 91.97, changes in MTR_t, ATR_t and W_t account for almost 92 percent of the variation in $NDINC_t$. Moreover, the F value of 45.80 for 3, 12 degrees of freedom assures us that we can be 99.5 percent confident that there is some relationship between $NDINC_t$ and the full set of independent variables.

The structure of the model suggests, then, that the aggregate income function (equation (4')) emerges from individual taxpayer solutions to constrained maximization problems of the form given by equations (1) and (2).

Equation (4') gives the aggregate solution to the individual taxpayers' stage one problem. The solution to the stage two problem is partly dependent upon the stage one solution.

Recall that the consumption-saving or stage two problem yields:

(5) $\quad S_t = f(NDINC_t, r_t),$

where S_t denotes aggregate personal saving at time t, and r_t denotes the current level of interest rates.

Substituting (4') into (5), we have then that:

(6) $\quad S_t = g(MTR_t, ATR_t, W_t, r_t),$

so that personal saving is understood to be a function of marginal and average tax rates, wealth, and the level of interest rates, all defined for the current time period..

There is, however, a complication. As has been emphasized, much attention has recently centered upon the distinction between social security and non-social security wealth. The presumption is, in other words, that taxpayer wealth can be broken down into two components. At issue, inter alia, is the effect on personal saving of changes in the two components of wealth. With this in mind, equation (6) may be rewritten as:

(7) $$S_t = h(MTR_t, ATR_t, NSSW_t, SSW_t, r_t),$$

where the notation $NSSW_t$ denotes non-social security wealth at t, and SSW_t represents social security wealth at t.

III. THE EMPIRICAL RESULTS

With the t-statistics in parentheses, the logarithmic estimate of equation (7) is:

$$\text{(8)} \qquad \ln S_t = \underset{(5.53)}{14.745} - \underset{(-2.65)}{0.756} \ln MTR_t - \underset{(-0.081)}{0.020} \ln ATR_t + \underset{(2.915)}{3.808} \ln NSSW_t - \underset{(-2.915)}{0.968} \ln SSW_t + \underset{(5.035)}{2.048} \ln r_t$$

$$R^2 = 96.5$$
$$F = 55.039$$
$$D\text{-}W + 1.96$$

The R^2 suggests that more than 96 percent of the variation in the dependent variable is accounted for by changes in the full set of independent variables, while the F value of 55.039 for 5, 10 degrees of freedom indicates that we can be 99.5 percent confident that there is some relationship between personal saving and the full set of independent variables. Finally, the Durbin-Watson statistic suggests that serial correlation among the residuals is virtually absent.[7/]

Perhaps most important, the t-statistics imply that we can be 95 percent confident that there is some relationship between personal saving and changes in the marginal tax rate; 98 percent confident that there is some relation between personal saving and non-social security wealth and between personal saving and social security wealth, and,finally, that we can be 99 percent confident that there is some relationship between personal saving and changes in interest rates. Only the average tax rate does not have a statistically significant impact upon personal saving.[8/]

Because equation (8) is expressed in log-log form, the regression coefficients are the elasticity coefficients. The results suggest that, other things equal: a 10 percent increase (decrease) in the marginal tax rate would result in a 7.56 percent decrease (increase) in personal saving; a 10 percent increase (decrease) in non-social security wealth would result in a 38.1 percent increase (decrease) in personal saving; a 10 percent increase (decrease) in social security wealth would result in a 9.68 percent decrease (increase) in personal saving, and a 10 percent increase (decrease) in interest rates would result in a 20.5 percent increase (decrease) in personal saving.[9/]

IV. INTERPRETATION AND SIGNIFICANCE OF THE RESULTS

A recurring theme in discussions centering on the efficacy of "supply-side" tax policies is the question of the impact on personal saving of changes in marginal tax rates. Discussions focus, in general, upon the relative magnitudes of the substitution and income effects associated with changes in tax rates. As is well known, while the substitution effect must be negative, the income effect can be either negative or positive. On this logic, nothing can be said *a priori* about the effect on personal saving of changes in marginal tax rates.

The results outlined above suggest that changes in marginal tax rates do have a statistically significant effect upon personal saving, and that the relationship is inverse. The results suggest that, in the aggregate, the substitution effect outweighs the income effect.

The positive relationship between personal saving and non-social security wealth is at variance with the relation implied by the life-cycle framework of Harrod (1948), Ando-Modigliani (1963) and Modigliani-Brumberg (1955). The results suggest, *inter alia*, that savers may be motivated by something more than provision for post-retirement consumption. A desire to effect inter-generational transfers may be at least a partial motivation. In any case, the implication is that there can be no presumption that increases in non-social security wealth will bring about a reduction on personal saving.

The statistically significant inverse relationship between changes in social security wealth and personal saving suggests that wealth effects (at least as they relate to personal saving) are asymmetric. On the one hand, changes in non-social security wealth imply changes in personal saving of like sign. On the other hand, changes in social security wealth induce changes in personal saving in the opposite direction. While it is difficult to know the precise cause of the asymmetry, it seems reasonable to suggest that the non-social security wealth-personal saving relation is at least partly influenced by a bequest motive, while the social security-personal saving relation may be dominated by the post-retirement consumption motive.[10/] In any case, the social security wealth-personal saving relation is consistent with results derived by Feldstein (1978), Boskin and Robinson (1980) and others.[11/]

It should be emphasized that earlier statistical tests of the social security wealth-personal saving relation employed variants of the life-cycle framework. So far as I know, the model outlined above is the first to relate changes in personal saving simultaneously to changes in marginal tax rates, interest rates, and non-social security and social security wealth.[12/]

Finally, the positive interest elasticity coefficient is not surprising. It is consistent with results derived by others. What is significant is the magnitude of the coefficient. The interest elasticity derived above (2.05) lies toward the upper bound of the range of recent empirical estimates of the interest elasticity of personal saving. Estimates range from a low of -0.04 (the interest elasticity of consumption with respect to

changes in interest rates) to a high of 3.54 (Jackson, 1981).[13] The point to be emphasized, however, is that the relationship is positive and statistically significant.[14]

As is well known, the dead-weight loss and the shortfall below the optimal saving rate are increasing functions of the interest elasticities of saving and investment (Boskin 1978, 1981). While these numbers are at best heuristic, it has been suggested that the marginal product of private capital may be as low as 0.08 or as high as 0.12 (Boskin, 1978; Feldstein and Summers, 1977). In contrast, the real net-of-tax rate of return to savers averaged about 0.03 over the postwar period through 1969 (Boskin, 1981). Granting this, saving and investment are below their optimal level. Given the relatively large interest elasticity of saving derived above, the implication is that the dead-weight loss associated with this shortfall is large.

The public policy implications emerge straightforwardly. Given that there is a shortfall of saving (and, pari passu, of investment), public policy initiatives hould be directed toward increasing saving. The evidence suggests that cuts in marginal tax rates would increase saving, as would policies that encourage the accumulation of non-social security wealth. In general, policies that encourage a redistribution of wealth in favor of non-social security wealth and away from social security wealth should be seriously considered.

Public policy in the postwar period has embodied a distinct anti-saving bias. Heavy taxation of capital income, persistent Federal deficits designed, inter alia, to "soak up" what was perceived to be "excess saving", tax code provisions that

encourage home mortgages and consumer borrowing, and a social security program that discourages saving for retirement income purposes have all played a role.[15/] Just as important, chronic high inflation -- itself induced by government policies -- has interacted with the tax code to encourage consumption rather than saving. The results outlined above suggest that reductions in marginal tax rates accompanied by other policies designed to encourage the accumulation of non-social security wealth would go a long way toward encouraging saving, investment, and more rapid economic growth.

APPENDIX I.

VARIABLE DEFINITIONS[1/]

Personal saving is personal income less personal tax and nontax payments, or disposable income less personal outlays. The saving rate is personal saving as a percent of disposable personal income.

The marginal and average tax rate variables are defined in Appendix II.

The proxy for interest rates is the Aaa corporate bond rate.

The proxy for non-social security wealth is the ratio of non-human to human income, where the latter is net of Old Age and Survivor Insurance (OASI) payments. Non-human income is the sum of proprietor income, rental income, personal dividends, and personal interest. Human income net of OASI is wage and salary disbursements plus other labor income plus transfer payments net of OASI.

The proxy for social security wealth is the ratio of non-human income to OASI income.

The logic behind the use of the ratio of non-human to human income as aproxy for wealth is provided in Pesek and Saving (1967, esp. p. 292). Because the stock of human wealth is not transferable from the owner of it, the presumption is that the discount rate applicable to a stream of human income exceeds

1/ The data base is drawn from the Economic Report of the President (1982).

that which applies to a stream of non-human income. It follows, pari passu, that a redistribution of income in favor of non-human income increases wealth; a redistribution in favor of human income reduces wealth.

APPENDIX II.

THE MARGINAL AND AVERAGE TAX RATE VARIABLES

Because of the progressive income tax structure, the taxpayer's decision environment is such that, as the absolute level of nominal income rises, the price of leisure and of consumption falls. The resulting change in relative prices is taken to be the catalyst to changed economic behavior.

While Buchanan (1952-53) and Gabor (1955-56) applied their analytical procedure to a somewhat different problem, in calculating the marginal and average rates I have adopted their basic approach.

The calculation of marginal and average tax rates proceeds as follows: The aggregate taxable income of taxpayers filing taxable returns is divided by the number of taxable returns.[1/] This determines, for each year over the period 1963 to 1978, the average taxpayer's taxable income.

Assuming that he filed a joint return, the marginal tax rate confronting the taxpayer during any year is determined by appeal to that year's tax rate schedule. The marginal tax rate is taken to be the marginal rate associated with the tax bracket into which the average taxpayer's taxable income falls.

The average tax rate in any year is taken to be the base tax for the bracket into which the average taxpayer's taxable income falls divided by the lower bound of the income bracket.

1/ The data source is the Office of the Secretary of Treasury, Office of Tax Analysis.

FOOTNOTES

1/ See, for example, Boskin (1978, 1981) and Feldstein (1981).

2/ Civilian employment grew at a compound annual rate of 1.8 percent during the 1960's. During the 1970's, employment growth accelerated to 2.4 percent. Net nonresidential private domestic investment grew at a 3.1 percent annual rate during the 1970's. This contrasts with a 1960's growth rate of 7.9 percent. See Economic Report of the President (1982, pp. 268, 251).

3/ Following Buchanan (1952-53) and Gabor (1955-56), it is possible to conceive of the taxpayer as confronting a discontinuous budget constraint. The discontinuities arise because of the progressive income tax structure.

4/ In constructing BB', I have assumed that adjustments to income and itemized deductions increase as the absolute level of nominal income rises. I assume, therefore, that the share of taxable income in nominal income falls as the latter rises.

5/ The marginal and average tax rates are those for taxpayers filing joint returns. See Appendix II for a discussion of the methods employed in calculating the tax rates.

6/ See, for example, Pesek and Saving (1967).

7/ See Appendix I for definitions of the dependent and independent variables appearing in equation (8).

8/ The logic for retaining the average tax rate in equation (8) despite its non-statistically significant relation to personal saving is straightforward. Were the average tax rate to be deleted, the estimate of the elasticity coefficient linking the marginal tax rate to personal saving would be biased upwards. See, for example, Taylor (1975).

9/ When equation (7) was estimated in linear form, the elasticity coefficients (evaluated at the mean) were similar. The elasticity coefficients linking changes in personal saving to changes in marginal tax rates, non-social security wealth, social security wealth, and interest rates were respectively: -0.654; +4.044; -1.314, and +1.856.

10/ This is really the same as saying that non-social security wealth accumulation may not, as some have suggested, be subject to a fixed terminal asset structure constraint. A desire for something more than the "purchase" of a post-retirement consumption stream may be operative.

11/ The minus sign on the social security wealth variable is not, however, invariant with respect to changes in model specification. When personal saving as a percent of disposable personal income is substituted for personal saving in equation (7), the following results emerge:

$$\ln SR_t = \underset{(1.343)}{4.468} - \underset{(-2.675)}{0.953} \ln MTR_t$$

$$+ \underset{(1.890)}{0.57'} \ln ATR_t + \underset{(1.853)}{3.022} \ln NSSW_t$$

$$+ \underset{(0.937)}{0.388} \ln SSW_t + \underset{(3.281)}{1.667} \ln r_t$$

$$R^2 = 62.0$$

$$F = 3.269$$

$$D\text{-}W = 2.134$$

where SR_t is the saving rate, or personal saving as a percent of disposable income at time t, and the numbers in parentheses are again the t- statistics.

The sign of the coefficient linking changes in personal saving (in absolute terms) to changes in the average tax rate was indeterminate in equation (8). Here, however, the relationship between changes in the average tax rate and changes in the saving rate is both statistically significant and positive. This suggests that the pure income effect to which changes in the average tax rate gives rise is negative. That is, an increase in the average tax rate, which reduces disposable income (other things equal), increases the saving rate. On the other hand, the statistically significant negative sign on the marginal tax rate suggests that the combined substitution and income effects to which a change in the marginal tax rate gives rise is negative: An increase (decrease) in the marginal tax rate will, other things equal, decrease (increase) the saving rate.

12/ While Boskin and Lau (1978) take "explicit account ... of leisure demand and also of the potential influence of social security" on private saving, their model does not introduce marginal and average tax rates. The model is conceptually similar to the one developed above, however, because they analyze consumption and labor supply conditions jointly.

13/ Steindl (1981) finds that a transferral of income from labor to capital will, because it increases the rate of return to saving, increase saving. His point estimate of the elasticity of saving with respect to the rate of return is a high -- relative to other empirical results -- 3.54. This finding is significant both because it supports the proposition that increases in its rate of return will increase private saving, and because it seems to corroborate the result derived above; namely, that increases in non-social security wealth increase rather than decrease private saving. (Recall that a redistribution of income away from human and toward non-human income increases wealth. See Appendix I.)

14/ The interest elasticity coefficient of 2.05 derived above is not significantly different than the 2.10 estimate derived by Roth and Policinski (1981). While Roth and Policinski introduced tax rates, interest rates and wealth as arguments in the aggregate personal saving function, they did not distinguish between non-social security and social security wealth. The stability of the interest elasticity coefficient suggests, therefore, that it is relatively invariant with respect to alternative model specifications.

15/ See, for example, Boskin (1981, esp. p. 209), Feldstein (1978, esp. p. 101), and Ture (1980, esp. pp. 326-327).

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